CHAPTER 1. INTRODUCTION

1.1 Background

The Savannah River Site (SRS) covers approximately 300 square miles (800 square kilometers) of land in southwestern South Carolina. The Site is approximately 25 miles (40 kilometers) southeast of Augusta, Georgia, and 20 miles (32 kilometers) south of Aiken, South Carolina (See Figure 1-1).

Until the end of the Cold War, the primary mission of the SRS was to produce nuclear materials that supported the defense, research, and medical programs of the United States. The end of the Cold War and the reduced size of the U.S. nuclear weapons stockpile have caused a dramatic reduction in the need for the nation to produce defense-related nuclear materials. The U.S. Department of Energy's (DOE's) mission at the SRS now emphasizes cleanup and environmental restoration.

In 1990, DOE assessed the impacts of continued operation of reactors at SRS and alternatives that would ensure the capability to produce nuclear materials for United States defense and nondefense programs (DOE 1990). With the change in mission at SRS, a *Supplement Analysis for Reactor Transition* (DOE 1994a) was prepared to determine if National Environmental Policy Act (NEPA) documentation to supplement this environmental impact statement (EIS) should be prepared to assess the impacts of reactor transition activities including associated facilities. TC This analysis initiated the NEPA process for the shutdown of the River Water System with the Assistant Secretary for Environmental Management directing DOE to prepare a Supplemental EIS to fully analyze the impacts of shutting down the River Water System and transition and deactivation activities. Subsequent internal scoping resulted in the recommendation to prepare a standalone EIS for this action. Sections 1.2 and 1.3 introduce the Proposed Action and alternatives, respectively.

DOE also developed the *DOE Savannah River Strategic Plan* (DOE 1996a) as guidance for meeting the changing missions. TC The Strategic Plan directs the SRS organizations to identify excess infrastructure (i.e., items that were once important parts of the processes with which the Site accomplished its missions) and to develop action plans for their disposition. As a result of this process, DOE identified the River Water System (Figure 1-2) as excess infrastructure.

The U.S. Atomic Energy Commission (AEC), a DOE predecessor agency, built the River Water System to provide secondary cooling water from the Savannah River to the five production reactors at the SRS (C-, K-, L-, P-, and R-Reactors). The system pumped water from the river to the reactor areas, where the water passed through heat exchangers to absorb heat from the reactor core. The heated discharge water returned to the river by way of several onsite streams. In 1958, the AEC built Par Pond by impounding Lower Three Runs to provide additional cooling water to P- and R-Reactors. In 1984, DOE built L-Lake by impounding Steel Creek to dissipate the thermal effluent from L-Reactor. As part of its 1988 decisions on alternative cooling water systems, DOE began the construction of a cooling tower to dissipate the thermal effluent from K-Reactor (53 FR 4203-4205). In response to its 1991 Record of Decision on the operation of K-, L-, and P-Reactors, DOE expedited and completed the construction of the cooling tower (56 FR 5584-5587).

The River Water System includes three pumphouses, two on the Savannah River (Pumphouses 1G and 3G) and one on Par Pond (Pumphouse 6G). Pumphouses 1G and 6G no longer operate. In addition, Pumphouse 5G and its piping comprise a separate system to support the D-Area powerhouse and are not part of this EIS. Each pumphouse contains 10 pumps;

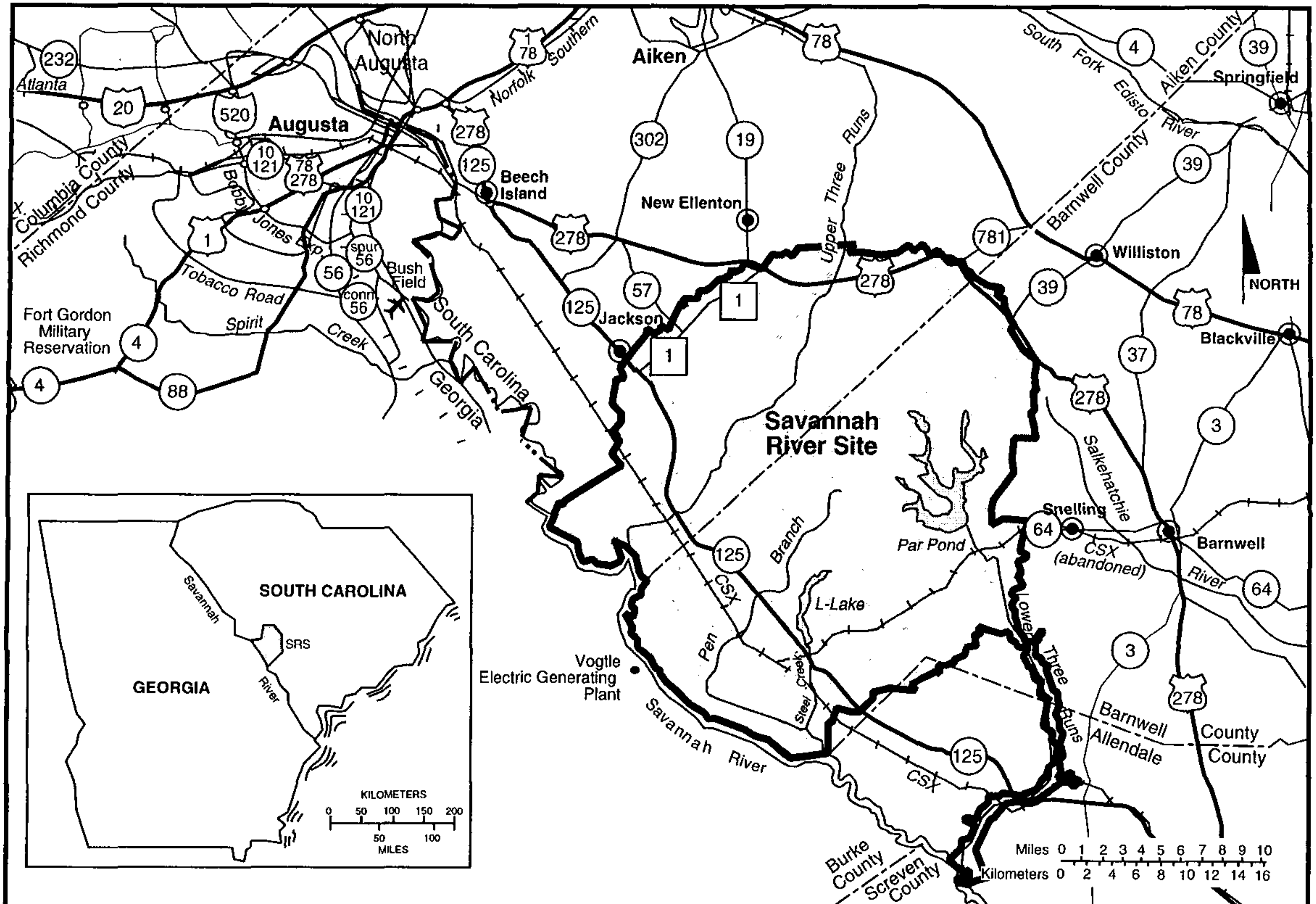

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Figure 1-1. Savannah River Site.

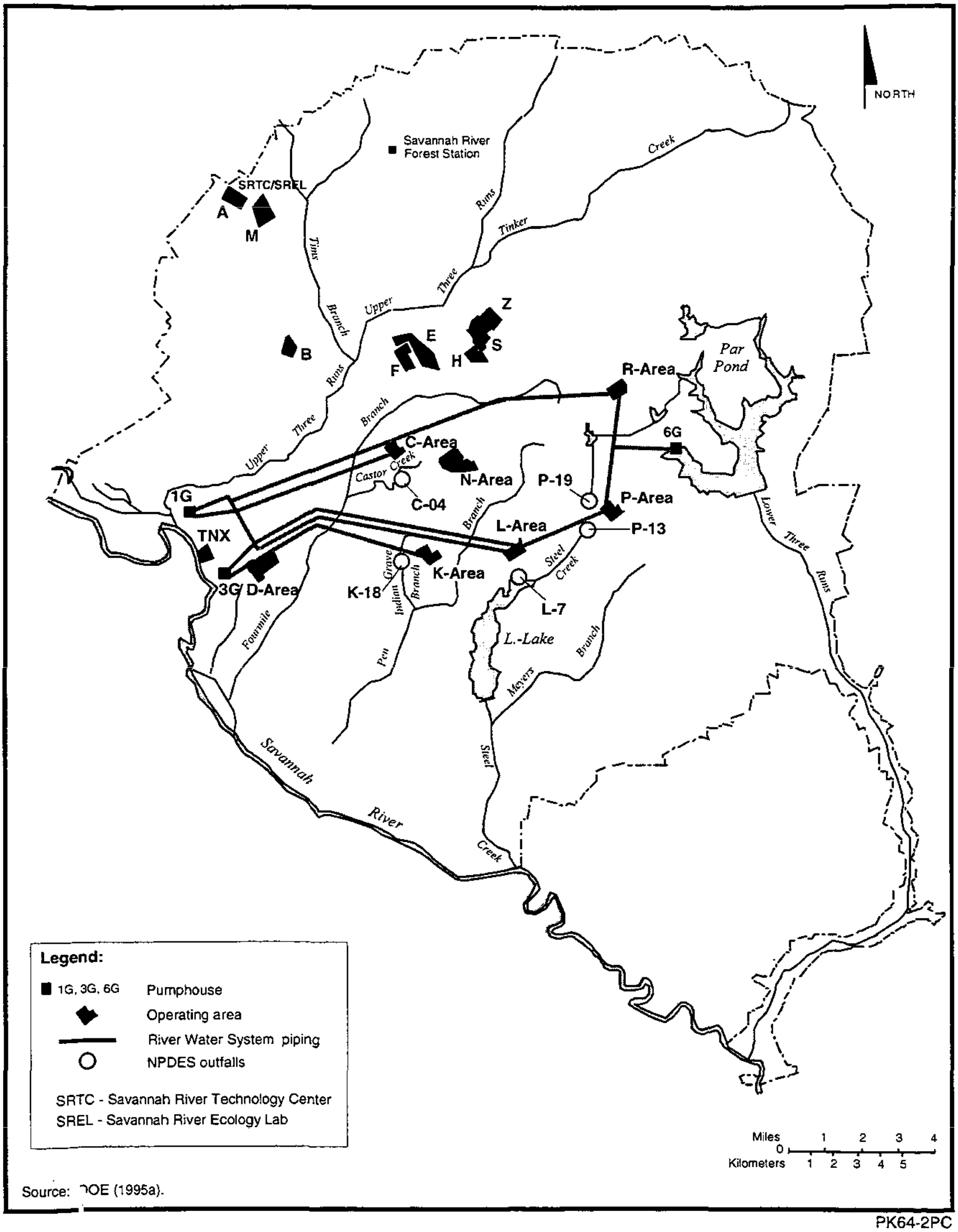

Figure 1-2. River Water System on SRS.

pump capacities vary from 24,000 gallons per minute (1.5 cubic meters per second) to 32,500 gallons per minute (2.1 cubic meters per second). Approximately 50 miles (80 kilometers) of underground concrete piping can deliver river water from the pumphouses to the reactor areas. When the reactors were operating, the River Water System delivered 174,000 gallons per minute (11.0 cubic meters per second) to each reactor area. At the time each reactor was shut down, the areas discharged their heated effluents as follows:

- From K-Reactor to Indian Grave Branch, then to Pen Branch and to the Savannah River
- From L-Reactor to L-Lake, then through the Steel Creek dam to Steel Creek and to the river
- From P-Reactor, recirculate in Par Pond, then excess through the Par Pond dam to Lower Three Runs and to the river
- From C-Reactor to Castor Creek, then to Fourmile Branch and to the river
- From R-Reactor, recirculate in Par Pond, then excess through the Par Pond dam to Lower Three Runs and to the river

Prior to the construction of L-Lake and Par Pond, the discharges from L-, P-, and R-Reactors were different from those described above. These earlier flow paths are described in Chapter 4.

Because the SRS reactors are not operating, there is no longer a need to provide secondary cooling water for the reactors with the exception of some small cooling loads in K- and L-Areas. DOE has taken several steps to save energy and money by reducing pumping. In 1993, Pumphouse 1G was placed in layup following the placement of the only remaining operable reactor (K-Reactor) in cold standby, and in 1995, Pumphouse 6G was deactivated and abandoned. As a result, the River Water System annual operation cost dropped from approximately $26 million in 1994 to $11.5 million in 1995.

In 1995, following completion of the *Environmental Assessment for the Natural Fluctuation of Water Level in Par Pond and Reduced Water Flow in Steel Creek Below L-Lake at the Savannah River Site* (DOE 1995a) and its associated Finding of No Significant Impact (DOE 1995b), DOE decided to discharge a minimum flow of 10 cubic feet (0.28 cubic meter) per second to Lower Three Runs and reduce pumping. The water level in Par Pond would fluctuate near its normal operating level of 200 feet (61.0 meters) above mean sea level but not go lower than 195 feet (59.4 meters). In addition, DOE decided to reduce the flow to L-Lake as long as it maintained the lake at its normal operating level of 190 feet (57.9 meters), and the flow in Steel Creek downstream of L-Lake did not fall below 10 cubic feet (0.28 cubic meter) per second. These actions were estimated to reduce annual pumping costs by $930,000 (DOE 1995a). DOE also determined that river water pumping would be required to avoid a continual drawdown of L-Lake to its original "pre-lake" (Steel Creek) condition (Jones and Lamarre 1994).

Currently DOE satisfies these and other minor system requirements by operating one of the 10 available pumps in Pumphouse 3G. This pump withdraws approximately 28,000 gallons per minute (1.8 cubic meters per second), which is approximately 23,000 gallons per minute (1.5 cubic meters per second) more water than is needed for current system uses. The river water is discharged from K- and L-Areas to Fourmile Branch, Pen Branch, L-Lake, and the headwaters of Steel Creek, respectively.

As a further energy and cost-saving initiative, DOE will operate a small 5,000-gallon-per-minute (0.32-cubic-meter-per-second) pump. The elimination of the 23,000 gallons per minute of excess water would save over $1 million in the annual cost of electricity. DOE intends to install and operate the small pump in the Spring of 1997, shortly before or shortly after issuance of this Final EIS.

Before taking this action, DOE reviewed Council on Environmental Quality (CEQ)

NEPA requirements (40 CFR 1508.4) and the DOE NEPA implementing procedures (57 FR 15122-15158) and determined that the action of installing the small pump is categorically excluded from requiring either an Environmental Assessment or an EIS. CEQ defines a categorical exclusion as an action that does not individually or cumulatively have a significant effect on the human environment.

DOE follows a detailed procedure to ensure that it identifies the appropriate level of NEPA documentation for its actions. If any of six prescreening evaluations are negative (e.g., potentially affects environmentally sensitive resources), the project sponsor is required to complete a detailed Environmental Evaluation Checklist (EEC). The EEC includes a detailed description of the project, identification of the applicable categorical exclusion (listed in the DOE NEPA implementing procedures), a NEPA checklist, and an environmental permits checklist.

DOE applied this process and determined that installation was an appropriate categorical exclusion as categorical exclusion B.5.1, Actions to conserve energy (57 FR 15122-15158).

The small pump will supply up to 4,800 gallons per minute (0.30 cubic meter per second) to L-Area to maintain its 186-Basin full (for fire protection) and overflowing to provide blending for the L-Area sanitary wastewater discharge, keep L-Lake at its normal operating level, and provide a minimum flow of 10 cubic feet (0.28 cubic meter) per second (approximately 4,500 gallons per minute) to Steel Creek. Up to 200 gallons per minute (0.013 cubic meter per second) would be pumped to K-Area to maintain its 186-Basin full for fire protection. The small pump would not pump to C- or P-Areas; this would eliminate current (November 1996) C-Area discharges to Fourmile Branch via Castor Creek and P-Area discharges to the headwaters of Steel C eek (WSRC 1995a). These flows vary but C-Ar a discharges averaged approximately 265 gallons per minute (0.017 cubic meter per second) during Water Year 1996 (i.e., October 1995 through September 1996). Since DOE diverted P-Area flow from Par Pond to Steel Creek, the discharge to Steel Creek (March through September 1996) has averaged 3,860 gallons per minute (0.24 cubic meter per second). In addition, flows from K-Area to Pen Branch, which have recently (July through September 1996) averaged approximately 7,400 gallons per minute (0.47 cubic meter per second) (Melendez 1996), would be reduced to no more than 400 gallons per minute (0.025 cubic meter per second), resulting from 210 gallons per minute from well-water-cooled compressors (WSRC 1996a) and 200 gallons per minute pumped from the River Water System to K-Area, less about 10 gallons per minute evaporation (WSRC 1995a). Table 1-1 compares 1996 discharge of river water to those that
L10-09 will occur under operation of the small pump
L16-03 and those that would occur if DOE shut down the River Water System.

Table 1-1. Discharges of river water to onsite streams (gallons per minute).[a]

Stream	Sept. 96	Small Pump Operation	Shutdown
Steel Creek (headwaters via P-13)	3,860	0.0	0.0
L-Lake (via L-7)	16,475	4,800	400[b]
Lower Three Runs	0.0	0.0	0.0
Fourmile Branch (via C-04 to Castor Creek)	265	0.0	0.0
Pen Branch (via K-18 to Indian Grave Branch)	7,400	400[c]	400[b]
Total Discharge (gpm)	28,000	5,200	800

L10-08

a. To convert from gallons per minute to cubic meters per second, multiply by 6.3×10^{-5}.
b. Maximum well water discharge.
c. 200 river water, 200 maximum well water discharge.

DOE has not performed maintenance on the equipment in Pumphouse 6G since its shutdown but does perform routine surveillance and maintenance on the equipment in Pumphouse 1G and the piping network. Inspections of the pipe system reveal infrequent problems that might require minor repairs and continued preventive maintenance. The consensus is that the piping is in excellent condition and is likely to experience minimal deterioration if DOE shuts down the piping system and implements a suitable layup, surveillance, and maintenance process (WSRC 1996b).

1.2 Proposed Action

DOE's Proposed Action, and its Preferred Alternative, is to shut down the River Water System and to place all or portions of the system in standby. Under this action, DOE could place portions of the system in a variety of conditions, such as shutting down and deactivating surplus portions that would not be capable of restart. Another example would be the placement of all or portions of the system in a layup condition to support potential future missions (i.e., DOE would shut the system down but preserve it so restart would be possible). In the layup condition, DOE could maintain portions of the system in a higher state of readiness, retaining the capability of restarting them in a relatively short period. Short-term cost savings would be minimal, but this condition would enable DOE to maintain a greater degree of flexibility.

Under the Preferred Alternative, DOE would have to develop and implement alternative sources to provide water for fire protection at K- and L-Reactor and implement an alternative for elimination of sanitary wastewater treatment plant discharges from L-Area. The cessation of river water input to L-Lake would result in the gradual disappearance of the lake and its reversion to the original conditions of Steel Creek. Unlike the Shut Down and Deactivate Alternative described below, the River Water System could be available to serve future DOE needs.

1.3 Alternatives to the Proposed Action

DOE is considering two alternatives to the Proposed Action. The first would be to continue the current operation of the River Water System (this is also the No-Action Alternative). Under this alternative, DOE would use the small pump to provide fire protection at K- and L-Reactor and blending flow for the L-Area sanitary waste treatment plant effluent. In addition, DOE would maintain the water level in L-Lake, discharge at least 10 cubic feet (0.28 cubic meter) per second from L-Lake to Steel Creek, and maintain pumps in Pumphouse 3G in operational readiness.

The second alternative would be to shut down and deactivate the River Water System. As described above for the Preferred Alternative, DOE would have to develop and implement alternative water sources, and the cessation of river water input to L-Lake would result in the gradual disappearance of the lake and its reversion to the original conditions of Steel Creek.

1.4 Associated Actions

In this evaluation of shutting down the River Water System, DOE considers a number of actions that must be implemented prior to system shutdown or continued operation with the small pump. DOE also considers potential future actions that could affect decisions on appropriate actions for the River Water System. Although this EIS does not attempt to make decisions on alternatives for such actions, it presents a perspective on how they might affect decisions on the River Water System. DOE believes that the actions described in the following paragraphs are associated with its decisions on the River Water System.

L-Lake Site Evaluation and Remedial Alternatives Study

DOE has established the process for environmental restoration activities at the SRS in accordance with the Federal Facility Agreement (FFA). The FFA is an agreement between DOE, the U.S. Environmental Protection Agency (EPA) and the South Carolina Department of Health and Environmental Control (SCDHEC). The FFA integrates DOE responsibilities under the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Chapter 5 provides detail on the requirements and compliance status of RCRA, CERCLA, and the FFA.

In accordance with the FFA, DOE prepared an internal draft site evaluation report for L-Lake that contained recommendations on whether there is a need for further investigation. Surface sediment samples collected for this evaluation and analyses to date indicate that cesium-137 is the primary contaminant of concern. In response to EPA comments on the Draft EIS, DOE has canceled plans to issue the Site Evaluation Report for regulatory review. Instead, DOE recommends further assessment of L-Lake under the FFA using the draft site evaluation as a basis for preparing the assessment.

At present, DOE has revised a preliminary (and conservative) risk-based analysis for exposure scenarios and remediation alternatives; it contains approximate costs for the remediation required to reduce risk to prespecified levels (PRC 1996; PRC 1997a,b,c). It was written to provide the decisionmaker with approximate costs that may be incurred in the future under various possible FFA (i.e., CERCLA) remedial options. Appendix A of this EIS describes the status and results of this L-Lake alternatives report and describes the process DOE uses to evaluate actually or potentially contaminated sites at the SRS.

Therefore, DOE must make a near-term (1997) operational decision on the River Water System in light of potential future remedial action at L-Lake. Because this potential remedial action is not yet ready for consideration, DOE followed recommendations published by its Office of NEPA Policy and Assistance (DOE 1993a), which indicate that DOE should treat such an action as a connected action with indirect effects. DOE described the cumulative impacts of the Proposed Action and the connected action (potential remedial actions) but would defer alternatives for the connected action until conceptual alternatives have been defined. If the remedial actions under the FFA called for the procedural and documentation requirements of NEPA, DOE would incorporate NEPA values in the FFA documents or, after consultation with stakeholders, could choose to integrate separate NEPA and FFA processes (DOE 1994a). Further, DOE would ensure that the near-term decisions on the River Water System did not limit the choice of reasonable alternative remedial actions under the FFA process (40 CFR 1506.1).

In accordance with the recommendations described above (DOE 1993a), this EIS bases the occupational and public health impacts of shutting down the River Water System on realistic exposure conditions. The EIS uses, in part, current data that are available from the remedial site evaluation for L-Lake, and this Final EIS uses an updated data set. Further, the EIS analyzes realistic exposure conditions for ecological receptors, the current facility worker (e.g., at L-Lake), the collocated worker (e.g., in L-Area), the hypothetical maximally exposed offsite individual, and the offsite population. The EIS also analyzes reasonably foreseeable future conditions. Based on the *SRS Future Use Report* (DOE 1996b), such conditions include a future facility worker (e.g., privatized industry) and public access for recreation but do not include a future resident.

CERCLA radiological analyses of human health differ from those used in the EIS; the CERCLA analyses report cancer morbidity (incidence) as the impact while the EIS estimates latent cancer fatalities. The CERCLA analysis uses ingestion, inhalation, and external exposure slope factors (PRC 1996) to estimate morbidity risk. The more traditional EIS approach calculates a committed effective dose equivalent from exposure to contaminated soil and multiplies this value by a dose-to-risk cancer mortality conversion factor from the International Commission on Radiological Protection (ICRP 1991). Further, impacts described in the EIS account for radioactive decay of the constituents over the exposure period. By not allowing for decay, the CERCLA analysis would overestimate risk.

Remedial Action Process for Onsite Streams

This action is not associated with the Proposed Action to shut down the River Water System. Rather, it is associated with operation of the small pump, which is part of the baseline in the No-Action Alternative. Steel Creek, Fourmile Branch, Pen Branch, Lower Three Runs, and Par Pond are on the RCRA/CERCLA Units List and will receive future evaluation and potential remedial actions under the requirements of the FFA. FFA Project Managers at EPA and SCDHEC have expressed concern about effects on these units due to actions on the River Water System. Basically, flows due to small pump operation under the No-Action Alternative would be less than those that occurred in 1996 in Fourmile Branch, Pen Branch, and the headwaters of Steel Creek; discharges to Lower Three Runs and Steel Creek at their dams would continue at 10 cubic feet (0.28 cubic meter) per second (4,500 gallons per minute). The extent of the reduction in Fourmile Branch, Pen Branch, and the headwaters of Steel Creek would be independent of the alternative DOE decided to implement. Onsite streams would approach natural flow conditions; operation of the small pump would keep L-Lake at its normal water level.

TC

Water Requirements for Alternatives

L12-03

Under the No-Action Alternative a combination of groundwater and river water from the small pump is required to supply the entire auxiliary equipment cooling water demand, sanitary waste water, fire protection, and maintenance of L-Lake levels. For the shutdown alternatives, DOE would need additional groundwater supplies to replace those that would be provided by the small pump under No Action. Table 1-2 presents a list of those requirements.

Air conditioning cooling water requirements for K- and L-Area are 1,510 gallons per minute (0.095 cubic meter per second) and 1,490

L12-03

Table 1-2. Water requirements for No-Action and shutdown alternatives.

Purpose for water	No-Action: River Water Demand (gpm)	No-Action: Groundwater Demand (gpm)	Shutdown: Groundwater Demand (gpm)
L-Area			
186-Basin Fire Protection Water	200	0	200
Auxiliary Equipment Cooling	0	190[a]	190
Sanitary Waste Water Blending	83	0	0[b]
Lake Level and Steel Creek Flow Maintenance	4,517[c]	0	0
K-Area			
186-Basin Fire Protection Water	200	0	200
Auxiliary Equipment Cooling	0	210	210
Total	5,000	400	800

a. Although not required for the No-Action Alternative, DOE switched this cooling water requirement from river water to groundwater.

b. Replaced by septic tank and tile field in the shutdown alternatives.

c. Total outflow to L-Lake is 4,800 gpm.

gallons per minute (0.094 cubic meter per second), respectively (WSRC 1996a). The 4,800 gallons per minute (0.30 cubic meter per second) that will be pumped to L-Area by the small pump and eventually released to L-Lake is sufficient to provide all L-Area cooling water requirements. TC

As a cost-saving initiative, DOE eliminated the 1,300 gallons-per-minute (0.082 cubic-meter-per-second) load for air conditioning in each area by replacing the original water-cooled system with an air-cooled system. This action reduces the K- and L-Area demands to 210 gallons per minute (0.013 cubic meter per second) and 190 gallons per minute (0.012 cubic meter per second), respectively. Groundwater would be used to supply the 400-gallon-per-minute (0.025 cubic meters per second) demand for auxiliary equipment cooling. Therefore, before operation of the small pump, DOE provided well water to meet current requirements. TC TC TC TE

Small sanitary wastewater treatment plants in K-, L-, and P-Areas discharge through National Pollutant Discharge Elimination System (NPDES)-permitted outfalls to Indian Grave Branch, L-Lake, and the headwaters of Steel Creek, respectively. The associated action is to resolve compliance issues, if any, that would occur if DOE stopped pumping river water due to a decision to implement a shutdown alternative.

The P-Area sanitary wastewater plant was deactivated in November 1996, which eliminates its discharge. Because it is a package unit, it is being maintained for potential use at another location (Dukes 1997). The wastewater discharge from K-Area presents three potential concerns: TC

1. The elimination of river water pumping would affect permit limits due to loss of blending credit. TC
2. The effluent would not flow as far as the sampling point.
3. The effluent would not reach the intended receiving stream.

In relation to the first concern, calculations confirm that blending flow is not required at K-Area outfall (Huffines 1996a). DOE has also resolved the other two concerns with SCDHEC. DOE would not need to modify permit requirements or alter discharge paths if it moved the outfall to a location that would enable continuous sampling. Because there would be no discharge to the receiving stream except during storm events, DOE would address stormwater flows in the existing Stormwater General Permit (Smith 1996). TE

Calculations (Huffines 1996b) indicate that the effluent from the L-Area Sanitary Wastewater Treatment Plant would not meet SCDHEC standards for water quality without blending from other area effluents, such as river water flows. Under the No-Action Alternative, DOE requires 83 gallons per minute (0.0052 cubic meters per second) blending water through operation of the small pump (Huffines 1996b). Under a shutdown alternative, DOE would need an alternative method to meet SCDHEC standards for water quality. A recent DOE study presents three options (septic tanks and tile field, spray fields, and tying into the existing central system) and approximate costs for treating the L-Area sanitary wastewater (Huffines 1996b). DOE includes these possible cost impacts in Section 4.1.2 to enable a determination of the effect of those options on decisions about the River Water System. TC TC TE TC

Finally, DOE uses the 25-million-gallon (95,000-cubic-meter) 186-Basins in K- and L-Area as a long-term fire protection water supply source. In L-Area, a 4,800 gallon-per-minute (0.30 cubic-meter-per-second) overflow is maintained from the 186-Basin, which eventually discharges from NPDES permitted outfall L-07 to L-Lake. In K-Area, the 186-Basin is operated as a retention basin with no pumped withdrawal of water; however, the estimated latent water loss rate from the K-Area 186-Basin (evaporation and drain gate valve leakage) is about 110 gallons per minute (0.0069 cubic meter per second). To provide a liberal margin due to uncertainty in leakage, TC

DOE provides 200 gallons per minute (0.013 cubic meter per second) of river water to the K-Area 186-Basin. This water loss rate would also apply to the L-Area 186-Basin if DOE selects a shutdown alternative. The capability to supply up to 400 gallons per minute (0.025 cubic meter per second) of alternative make-up water for fire protection must exist concurrent with the shutdown of the River Water System. DOE has determined that this make-up capacity could be provided by the existing K- and L-Area well water system.

Reactor 186-Basins Alternative Uses Study

In 1994, DOE studied the feasibility of using the SRS C-, L-, P-, and R-Reactor 186-Basins and 904-Retention Basins for aquacultural purposes (WSRC 1994a). This study indicated that raising hybrid striped bass or Australian crayfish would be feasible and potentially profitable alternative uses for the 186-Basins.

In March 1995 DOE advertised the availability of the reactor 186-Basins for commercial use. Several fish farming projects were solicited by the advertisement and, in one case, DOE was requested to provide assurance that secondary infrastructure would be available if investors funded use of the C-Area 186-Basin (Krist 1995). This project would require makeup water which could be supplied by river water or well water. Later that year, DOE accepted a fish farming proposal from a business partnership that would rely on make-up water supplied by the two C-Area deep wells (not the river water supply system). However, the partnership later made a business decision not to pursue the farming project and withdrew its proposal. No alternative uses of the reactor 186-Basins are currently planned by DOE.